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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/710,405	07/08/2004	Yi-Ching Wu	13302-US-PA	4404

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JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE
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ROOSEVELT ROAD, SECTION 2
TAIPEI, 100
TAIWAN

EXAMINER	
MANDALA, VICTOR A	
ART UNIT	**PAPER NUMBER**
2826	

DATE MAILED: 06/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

B/L

Office Action Summary	Application No.	Applicant(s)	
	10/710,405	WU ET AL.	
	Examiner	Art Unit	
	Victor A. Mandala Jr.	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 April 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-8 and 27-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-8 and 27-34* is/are rejected.

7)☒ Claim(s) *35* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The Applicant has amended independent claim 1 to include the limitation, "wherein residuals are formed on an edge of at least one of the substrate, the dielectric layer, the hydrophilic material layer or combination thereof; performing a polish process on the edge of at least one of the substrate, the dielectric layer, the hydrophilic material layer or combination thereof to remove the residues". The examiner has considered the amendment and the Applicant's arguments where Barth et al. and Dalton et al. teach the planarizing of the entire layer of one of the recited layers and not only on the edge of one of the recited layers. The examiner finds the amendment and arguments non-persuasive because the independent claim 1 recites **on an edge** and not only on the edge, where the broadest reasonable interpretation of the limitation is the step of planarizing an entire layer will polish on the edge of one of the recited layers.

Claim Objections

Claims 34 and 35 are objected to because of the following informalities: The claims recite a mask, but the examiner is assuming the hardmask. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-5, and 7 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,737,747 Barth et al.

2. Referring to claim 1, a process of fabrication a semiconductor structure, comprising: providing a substrate, (Figure 2 #110); forming a dielectric layer, (Figure 2 #112), over the substrate, (Figure 2 #110); forming a hydrophilic material layer, (Figure 2 #113 where the layer is made out of SiN Col. 6 Lines 58-60), over the dielectric layer, (Figure 2 #112); wherein residuals are formed **on an edge** of at least one of the substrate, (Figure 2 #110), the dielectric layer, (Figure 2 #112), the hydrophilic material layer, (Figure 2 #113), or combination thereof; performing a polish process, (Col. 9 Lines 37-48), **on the edge** of at least one of the substrate, (Figure 2 #110), the dielectric layer, (Figure 2 #112), the hydrophilic material layer, (Figure 2 #113), or combination thereof to remove the residues forming a hardmask layer, (Figure 2 #120), over the hydrophilic material layer, (Figure 2 #113).

3. Referring to claim 3, a process of claim 2, wherein the planarization process comprises at least one of an upper bevel polish, a lower bevel polish, a side polish or a combination thereof, (Col. 9 Lines 37-48 the top side polish).

4. Referring to claim 4, a process of claim 1, wherein a method of forming the dielectric layer, (Figure 2 #112), comprises a spin on coating method or a chemical vapor deposition method, (Col. 6 Lines 7-13).

5. Referring to claim 5, a process of claim 1, wherein electric layer comprises an organic dielectric material, a carbon-containing dielectric material or a carbon- containing oxide material, (Col. 6 Lines 7-13).

6. Referring to claim 7, a process of claim 1, wherein a material of the hydrophilic material layer, (Figure 2 #113), comprises silane (SiH) containing material, tetraethyl-ortho-silicate (TEOS) oxide containing material or silicon nitride, (SiN Col. 6 Lines 58-60).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 27-30 & 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,737,747 Barth et al.

7. Referring to claim 27, a process of fabrication a semiconductor structure, comprising: providing a substrate, (Figure 2 #110); forming a first dielectric layer, (Figure 2 #112), over the substrate, (Figure 2 #110); forming a first hydrophilic material layer, (Figure 2 #113 where the layer is made out of SiN Col. 6 Lines 58-60), over the first dielectric layer, (Figure 2 #112);

wherein residuals are formed **on an edge** of at least one of the substrate, (Figure 2 #110), the first dielectric layer, (Figure 2 #112), the first hydrophilic material layer, (Figure 2 #113), or combination thereof; performing a first polish process, (Col. 9 Lines 37-48), **on the edge** of at least one of the substrate, (Figure 2 #110), the first dielectric layer, (Figure 2 #112), the first hydrophilic material layer, (Figure 2 #113), or combination thereof to remove the residues forming a first hardmask layer, (Figure 2 #120), over the first hydrophilic material layer, (Figure 2 #113), forming a second dielectric layer, (Figure 2 #112 and See * below), over the first hardmask layer, (Figure 2 #113); forming a second hydrophilic material, (Figure 2 #113 and See * below), layer over the second dielectric layer, (Figure 2 #112 and See * below), wherein second first residuals are formed on an edge of at least one of the substrate, (Figure 2 #110), the first dielectric layer, (Figure 2 #112), the first hydrophilic material layer, (Figure 2 #113), the second dielectric layer, (Figure 2 #112 and See * below), the second hydrophilic material layer, (Figure 2 #113 and See * below), or a combination thereof performing a second polish process, (Col. 9 Lines 37-48 & See * below), on the edge of at least one of the substrate, (Figure 2 #110), the first dielectric layer, (Figure 2 #112), the first hydrophilic material layer, (Figure 2 #113), the second hydrophilic material layer, (Figure 2 #113 and See * below), or a combination thereof to remove the second residues; and forming a second hardmask layer, (Figure 2 #120 and See * below), over the second hydrophilic material layer, (Figure 2 #113 and See * below).

* Barth et al. discloses the claimed invention except for the repeated steps of forming a second dielectric layer, a second hydrophilic material layer, and a second hardmask layer in the first layers and where a second step of polishing on the edge of the recited layers to remove the residuals that may have formed. It would have been obvious to one having skill in the art at the

time the invention was made to repeat the first steps and form a stack of repeating layers in the same manner of the process used for the first stack, since it has been held that mere duplication of the essential working parts of a device or processes involves only routine skill in the art. St. Regis Paper Co. vs. Bomis Co. 193USPQ8

8. Referring to claim 28, a process of claim 27, wherein the first and second polish processes comprise at least one of an upper bevel polish, a lower bevel polish, a side polish or a combination thereof, respectively, (Col. 9 Lines 37-48 the top side polish).

9. Referring to claim 29, a process of claim 27, wherein a method of forming the first and second dielectric layer, (Figure 2 #112), comprises a spin on coating method or a chemical vapor deposition method, (Col. 6 Lines 7-13).

10. Referring to claim 30, a process of claim 27, wherein the first and second dielectric layer comprise an organic dielectric material, a carbon-containing dielectric material or a carbon-containing oxide material, respectively, (Col. 6 Lines 7-13).

11. Referring to claim 32, a process of claim 27, wherein the first and second hydrophilic material layers, (Figure 2 #113), comprises silane (SiH) containing material, tetraethyl-ortho-silicate (TEOS) oxide containing material or silicon nitride, (SiN Col. 6 Lines 58-60).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 6 & 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,737,747 Barth et al. in view of U.S. Patent Application Publication No. 2005/0194619 Edelstein et al.

12. Referring to claims 6 & 31, a process of claims 1 & 27, wherein the dielectric layer, (Barth et al Figure 2 #112), is composed of at least a precursor comprising tetramethyl-cyclotetra-siloxane (TMCTS), trimethyl-silane (3MS), tetramethyl-silane (4MS), dimethyl-dimethoxy-silane (DMDMOS), octamethyl-cyclote-tra-siloxane (OMCTS), diethoxy-methyl-silane (DEMS), or tetramethyl-disiloxane (TMDSO), (See ** below).

** Barth et al discloses the claimed invention except for the precursors used to make the dielectric film, (SiCOH with a dielectric constant of 1.8 and greater, Col. 6 Lines 35-39), but Edelstein et al does. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the teachings of Barth et al. with the teachings of Edelstein et al., because using the listed precursors in making a SiCOH layer enhances the Si-CH_2-Si bridging in which allows the material to have a dielectric constant of 1.8 and greater, (Edelstein et al. Paragraph 0092), and since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 4, 5, 7, and 8 is rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,734,096 Dalton et al.

13. Referring to claim 1, a process of fabrication a semiconductor structure, comprising: providing a substrate, (Figure 2A #10); forming a dielectric layer, (Figure 2A #11), over the substrate, (Figure 2A #10); forming a hydrophilic material layer, (Figure 2A #12 where the layer is made out of SiN Col. 3 Lines 33-37), over the dielectric layer, (Figure 2A #11); wherein residuals are formed **on an edge** of at least one of the substrate, (Figure 2A #10), the dielectric layer, (Figure 2A #11), the hydrophilic material layer, (Figure 2A #12), or combination thereof; performing a polish process **on the edge** of at least one of the substrate, (Figure 2A #10), the dielectric layer, (Figure 2A #11), the hydrophilic material layer or combination thereof to remove the residues forming a hardmask layer, (Figure 2A #20), over the hydrophilic material layer, (Figure 2A #12).

14. Referring to claim 4, a process of claim 1, wherein a method of forming the dielectric layer, (Figure 2A #11), comprises a spin on coating method or a chemical vapor deposition method, (Col. 3 Lines 38-40).

15. Referring to claim 5, a process of claim 1, wherein electric layer comprises an organic dielectric material, a carbon-containing dielectric material or a carbon- containing oxide material, (Col. 3 Lines 38-40).

16. Referring to claim 7, a process of claim 1, wherein a material of the hydrophilic material layer, (Figure 2A #12), comprises silane (SiH) containing material, tetraethyl-ortho-silicate (TEOS) oxide containing material or silicon nitride, (SiN Col. 3 Lines 33-37).

17. Referring to claim 8, a process of claim 1, wherein a material of the hardmask layer, (Figure 2A #20), comprises aluminum (AI), titanium nitride, tantalum nitride, titanium silicon nitride (TiSiN), tungsten nitride, tungsten silicon nitride (WSiN) or refractory nitride, (Col. 3 Lines 56-60).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title; if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 27, 29, 30, 32, & 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,734,096 Dalton et al.

18. Referring to claim 27, a process of fabrication a semiconductor structure, comprising: providing a substrate, (Figure 2A #10); forming a first dielectric layer, (Figure 2A #11), over the substrate, (Figure 2A #10); forming a first hydrophilic material layer, (Figure 2A #12 where the layer is made out of SiN Col. 3 Lines 33-37), over the first dielectric layer, (Figure 2A #11);

wherein residuals are formed **on an edge** of at least one of the substrate, (Figure 2A #10), the first dielectric layer, (Figure 2A #11), the first hydrophilic material layer, (Figure 2A #12), or combination thereof; performing a first polish process **on the edge** of at least one of the substrate, (Figure 2A #10), the first dielectric layer, (Figure 2A #11), the first hydrophilic material layer or combination thereof to remove the first residues forming a first hardmask layer, (Figure 2A #20), over the first hydrophilic material layer, (Figure 2A #12); forming a second dielectric layer, (Figure 2A #11 and See * below), over the first hardmask layer, (Figure 2A #20); forming a second hydrophilic material layer, (Figure 2A #12 and See * below), over the second dielectric layer, (Figure 2A #11 and See * below), wherein second first residuals are formed on an edge of at least one of the substrate, (Figure 2A #10), the first dielectric layer, (Figure 2A #11), the first hydrophilic material layer, (Figure 2A #12), the second dielectric layer, (Figure 2A #11 and See * below), the second hydrophilic material layer, (Figure 2A #12 and See * below), or a combination thereof performing a second polish process on the edge of at least one of the substrate, (Figure 2A #10), the first dielectric layer, (Figure 2A #11), the first hydrophilic material layer, (Figure 2A #12), the second hydrophilic material layer, (Figure 2A #12 and See * below), or a combination thereof to remove the second residues; and forming a second hardmask layer, (Figure 2A #20 and See * below), over the second hydrophilic material layer, (Figure 2A #12 and See * below).

Dalton et al. discloses the claimed invention except for the repeated steps of forming a second dielectric layer, a second hydrophilic material layer, and a second hardmask layer in the first layers and where a second step of polishing on the edge of the recited layers to remove the residuals that may have formed. It would have been obvious to one having skill in the art at the

time the invention was made to repeat the first steps and form a stack of repeating layers in the same manner of the process used for the first stack, since it has been held that mere duplication of the essential working parts of a device or processes involves only routine skill in the art. St. Regis Paper Co. vs. Bomis Co. 193USPQ8

19. Referring to claim 29, a process of claim 27, wherein a method of forming the first and second dielectric, (Figure 2A #11), comprises a spin on coating method or a chemical vapor deposition method, (Col. 3 Lines 38-40).

20. Referring to claim 30, a process of claim 27, wherein the first and second dielectric layer comprise an organic dielectric material, a carbon-containing dielectric material or a carbon-containing oxide material, respectively, (Col. 3 Lines 38-40).

21. Referring to claim 32, a process of claim 27, wherein the first and second hydrophilic material layers, (Figure 2A #12), comprises silane (SiH) containing material, tetraethyl-ortho-silicate (TEOS) oxide containing material or silicon nitride, (SiN Col. 3 Lines 33-37).

22. Referring to claim 33, a process of claim 27, wherein the first and second hardmask layers, (Figure 2A #20), comprises aluminum (AI), titanium nitride, tantalum nitride, titanium silicon nitride (TiSiN), tungsten nitride, tungsten silicon nitride (WSiN) or refractory nitride, (Col. 3 Lines 56-60).

23. Referring to claim 34, a process of claim 27, further comprising forming a via, (Figure 2D #24), in the first dielectric layer, (Figure 2A #11), the first hydrophilic layer, (Figure 2A #12), and the first mask layer, (Figure 2A #20).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 6 & 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,734,096 Dalton et al. in view of U.S. Patent Application Publication No. 2005/0194619 Edelstein et al.

24. Referring to claims 6 & 31, a process of claims 1 & 27, wherein the dielectric layer, (Dalton et al. Figure 2A #11), is composed of at least a precursor comprising tetramethyl-cyclotetra-siloxane (TMCTS), trimethyl-silane (3MS), tetramethyl-silane (4MS), dimethyl-dimethoxy-silane (DMDMOS), octamethyl-cyclote-tra-siloxane (OMCTS), diethoxy-methyl-silane (DEMS), or tetramethyl-disiloxane (TMDSO), (See *** below).

*** Dalton et al discloses the claimed invention except for the precursors used to make the dielectric film, (SiCOH with a dielectric constant of < 4.5, Col. 1 Lines 44-46 and Col. 3 Lines 38-40), but Edelstein et al does. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the teachings of Dalton et al. with the teachings of Edelstein et al., because using the listed precursors in making a SiCOH layer enhances the Si-CH_2-Si bridging in which allows the material to have a dielectric constant of 1.8 and greater, (Edelstein et al. Paragraph 0092), and since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Allowable Subject Matter

25. Claim 35 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Victor A. Mandala Jr. whose telephone number is (571) 272-1918. The examiner can normally be reached on Monday through Thursday from 8am till 6pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J. Flynn can be reached on (571) 272-1915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

VAMJ
6/15/06

EVAN PERT
PRIMARY EXAMINER